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REPORT
TO
PARKING AUTHORITY OF SAN FRANCISCO
ON
PROPOSED PUBLIC GARAGES
IN VICINITY OF
SAINT MARY'S SQUARE

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SEPTEMBER, 1950

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REPORT

TO

PARKING AUTHORITY OF SAN FRANCISCO

ON

PROPOSED PUBLIC GARAGES

IN VICINITY OF

ST. MARY'S SQUARE

SEPTEMBER 1950

BUREAU OF ENGINEERING
DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF SAN FRANCISCO

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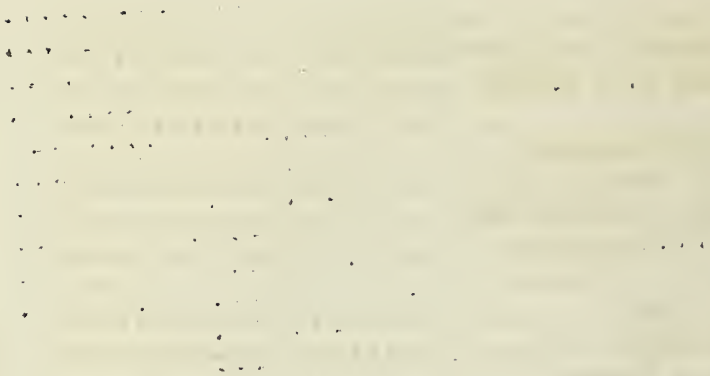

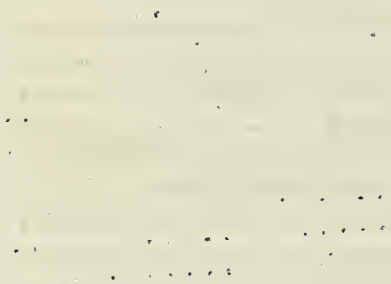

FOREWORD

The following report was prepared at the request of the Parking Authority of San Francisco by the Bureau of Engineering of the Department of Public Works. It is based principally on surveys previously made and on records and reports assembled by the Bureau.

Valuable information on recent garage proposals was furnished by Mr. Vining T. Fisher, General Manager of the Authority. Mr. MacDonald, Secretary of the Authority, assisted in the making of certain field checks of previous parking surveys.

Within the Bureau of Engineering, Mr. Ross T. Shoaf, Traffic Engineer, was responsible for the preparation of data on parking and Mr. Alfred V. Bowhay, Planning Engineer was responsible for the economic studies.

September 5, 1950

Ralph G. Wadsworth
City Engineer

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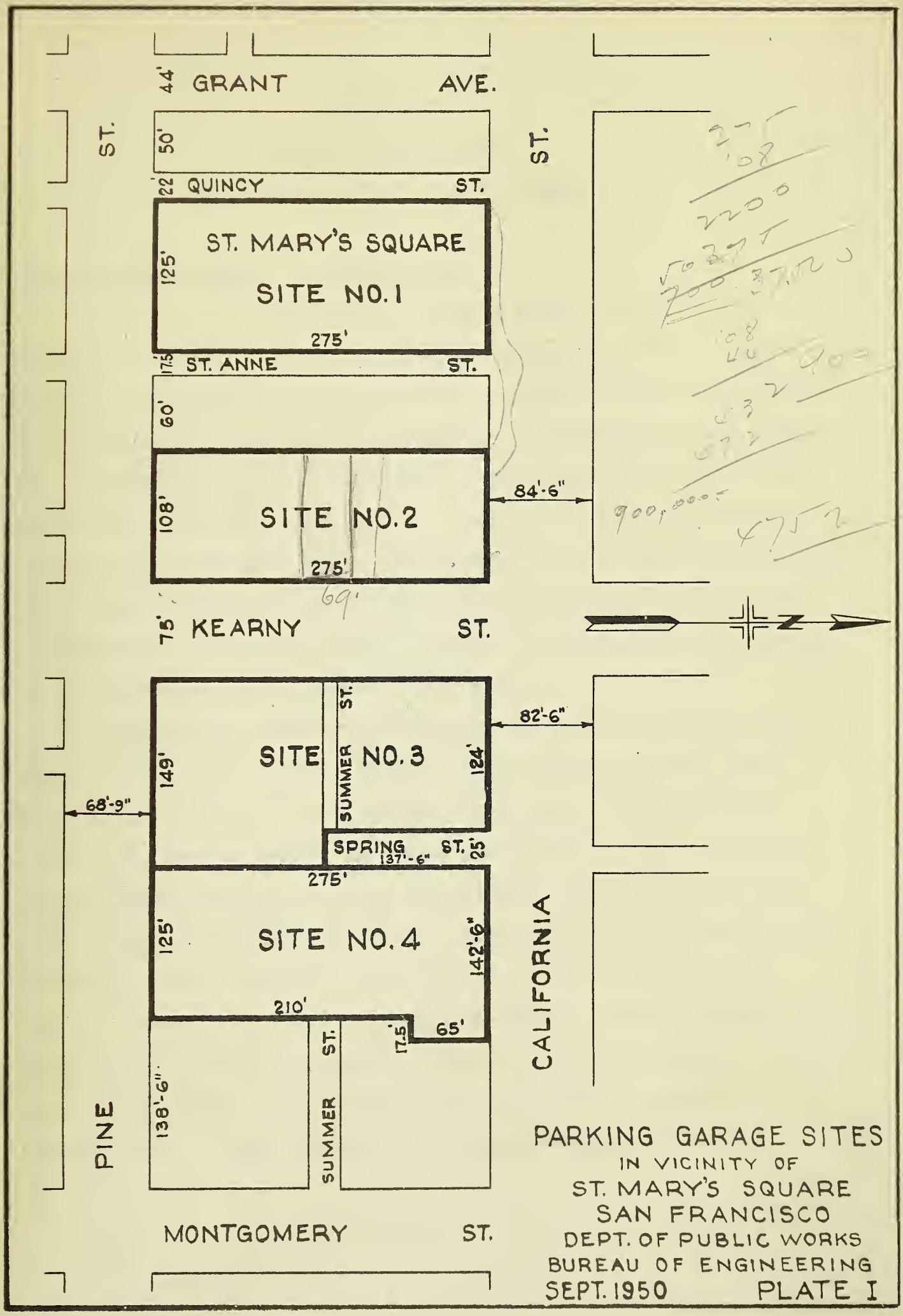
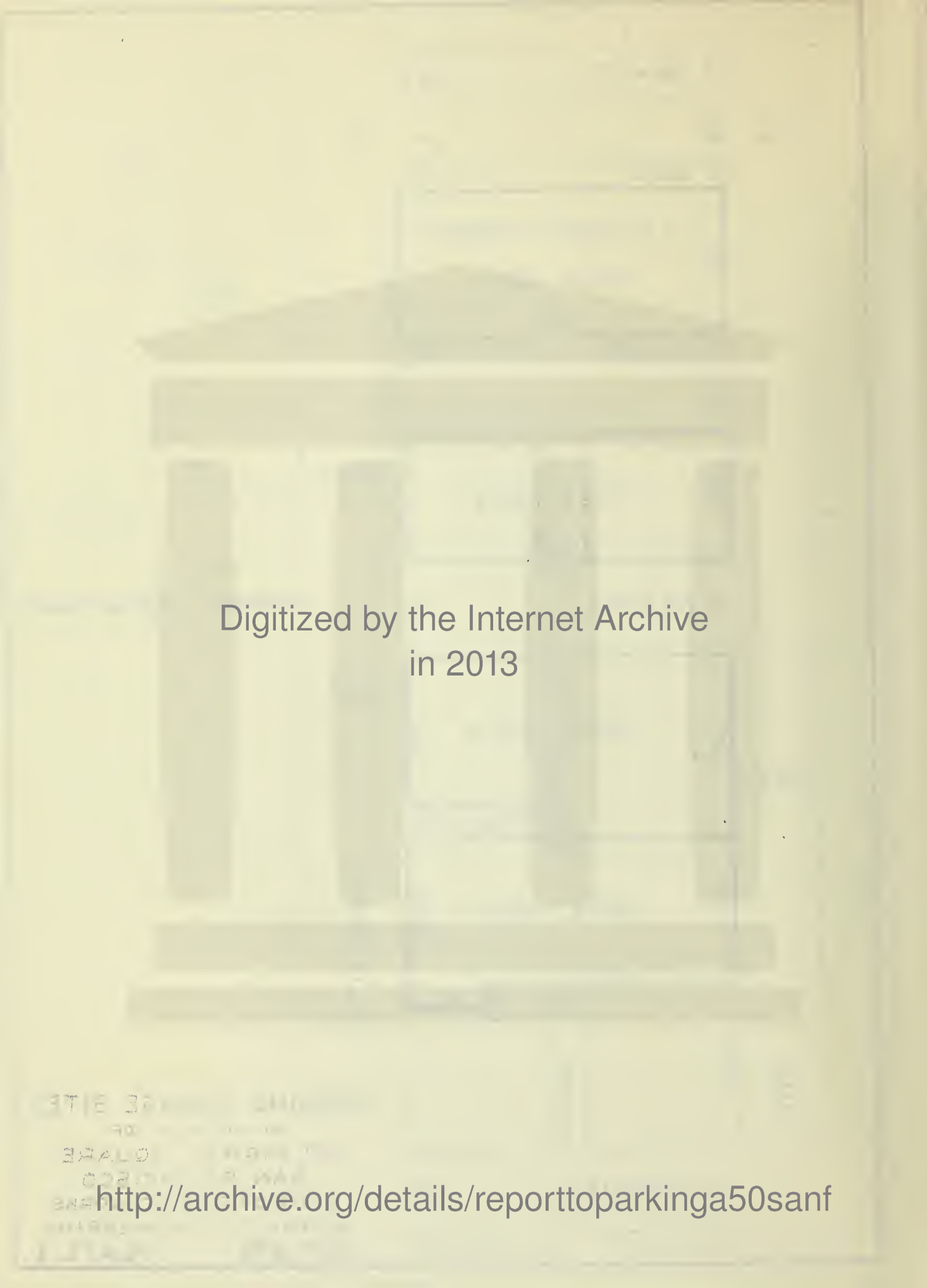

44'
GRANT
AVE.
ST.
50'
22'
QUINCY
ST.
ST.
ST. MARY'S SQUARE
SITE NO. 1
125'
275'
17.5
ST. ANNE
ST.
60'
108'
SITE NO. 2
275'
84'-6"
75'
KEARNY
ST.
SITE NO. 3
SUMMER
ST.
149'
124'
82'-6"
68'-9"
SPRING
ST.
25'
137'-6"
275'
SITE NO. 4
125'
142'-6"
210'
65'
17.5
138'-6"
SUMMER
ST.
PINE
CALIFORNIA
MONTGOMERY
ST.
PARKING GARAGE SITES
IN VICINITY OF
ST. MARY'S SQUARE
SAN FRANCISCO
DEPT. OF PUBLIC WORKS
BUREAU OF ENGINEERING
SEPT. 1950
PLATE I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REPORT ON

PROPOSED PUBLIC GARAGES

IN VICINITY OF ST. MARY'S SQUARE

INTRODUCTION, SUMMARY AND CONCLUSIONS

This report contains preliminary basic information on a project to provide a public parking garages at or near St. Mary's Square in San Francisco, this general location having been selected by the Parking Authority for its initial undertaking in the City. The material presented is intended to serve as a basis for determining the most suitable location of such a garage, the desirable capacity, and the justifiable investment of public or private funds. It should also be of value if the Parking Authority should desire to negotiate with private parties for the construction of a garage or its operation after completion or both.

The report summarizes extensive studies of four possible garage sites, one being St. Mary's Square itself and the other three being sites for above-ground structures located directly east of St. Mary's Square, as shown on Plate I. The analysis of parking demand in the vicinity demonstrates that between 700 and 1500 additional parking spaces are needed and would be used in the vicinity if made available, and that the future trend will be upward. Actual capacity of garages should be limited by the capacity of adjoining streets to take care of traffic, and it is recommended that no single garage be built with a capacity exceeding 1000 cars. After taking into account demand, traffic

limitations and conditions imposed by construction cost and garage operation, it is found that the maximum capacities at the four sites would be about 520, 600, 820 and 950 stalls respectively.

With reference to design of garages, it is pointed out that aisles should be 22 ft. wide and stalls should be not less than 7-1/2 ft. wide with sufficient length to accommodate automobiles 18 ft. long. The facilities for delivery of cars to exits should be sufficient to take care of fifty percent of total capacity during a half hour period. Mechanical parking devices should be avoided for the present. Open wall construction with lattice work should be permitted, subject to approval of the Art Commission.

For each of the four sites considered, estimates are given for (1) Required Capital Investment, (2) Annual Income (3) Annual Operating Cost and (4) Net Operating Income.

The net operating income represents the amount which would be available annually to pay the interest and amortization charges, income and property taxes and profit to private operators. The distribution of this income, among the various items, would depend on the type of financing adopted, and is not attempted in the report. It is shown, however, that the amount of annual income would be roughly two percent of total investment in an underground garage at St. Mary's Square and would be between 4.4% and 5% for the above-ground garages. The total required investment varies from $1,800,000 to $3,350,000.

From the material presented in the report the following conclusions can be drawn:

(1) A garage on any of the sites proposed would be justified by the demand for parking.

(2) The above-ground garages will pay more than twice as much return on investment as the underground garage in St. Mary's Square, in spite of the free land at the latter.

(3) Site 4 indicates the highest return on investment and the highest ratio of demand to capacity and is best located for convenient ingress and egress.

(4) Sites 2 and 3 have lesser capacities and somewhat lower rate of return on investment. There is not much choice between the two, but Site 3 should be given preference because of larger capacity.

(5) Site 1 (St. Mary's Square) would seem to be eliminated because of small capacity and low rate of return on investment, unless it is found desirable to completely finance a garage with public funds and without disturbing privately owned property.

SELECTION OF SITES FOR STUDY

In accordance with the instructions of the Parking Authority, this report is devoted solely to studies of possible new garages to be constructed at St. Mary's Square or within approximately one block thereof. The square is a public park extending from Pine St. to California St. in the block between Kearny St. and Grant Ave. It is within 100 ft. of Grant Avenue, the main street and shopping artery of San Francisco's famous "Chinatown", which attracts great numbers of tourists and pedestrians. It lies in a general way near the dividing line between the downtown financial district on the east and a residential and apartment house district on the west. The retail shopping district is about four blocks to the south.

Previous parking studies have demonstrated that the St. Mary's Square location is near the fringe of the heavy parking demand and that a site farther east or farther south would serve a more pressing need. In reviewing possible sites for study, it immediately became apparent that the block to the south of the Square could be eliminated from consideration because of high land and improvement values. To the east, however, land values are obviously lower and existing buildings and improvements are approaching obsolescence. It appeared that the cost of acquiring property in this area should be moderate in spite of the probable high potential land value.

Conforming with the Authority's limitation of one block from St. Mary's Square, three additional sites were selected for study, all being directly to the east, giving four sites in all as follows:

No. 1 St. Mary's Square - 275 ft. by 124 ft. inside of surrounding streets.

No. 2 West Side of Kearny St. - 108 ft. depth (Lots 1 to 9 and Lot 31 in Block 258).

No. 3 East Side of Kearny St. - 149 ft. depth (Lots 5 to 15 in Block 259).

No. 4 Mid-block area between Kearny and Montgomery Streets (occupied by Barretts Garage and stores-Lots 4 and 17, Block 259).

These sites are shown on Plate I. It will be noted that all of them have frontages on both Pine and California Streets. Because of existing street grades, Site 1 lies about 28 feet in elevation above Kearny St. and Site 4 about 17 feet below. California St. is the widest street in the downtown area north of Market St. Pine St. is restricted to one-way traffic west-bound. Sites 2 and 3 would have the most street frontage for possible ground floor stores and shops.

The City's Real Estate Department has made estimates of the cost of acquiring Sites 2, 3 and 4, including land, buildings, other improvements, leases, and removal of equipment and furnishings, but not including the wrecking of existing buildings. The estimates are intended to be sufficiently accurate to serve as a basis for arriving at probable overall project costs when combined with construction and incidentals. They should also be sufficiently accurate to determine the amount of bonds to be sold by the Parking Authority if it should be decided to buy one of the sites with public funds.

The following tabulation gives for each of the sites the area, the estimated cost to acquire, and the corresponding cost per square foot:

TABLE I

LAND COST

Site	Area Sq. Ft.	Cost to Acquire	Cost per Sq. Ft.
1	34,375	-	-
2	29,700	$900,000	$ 29.30
3	37,538	1,250,000	33.30
4	35,513	1,000,000	28.20

PARKING DEMAND

Before fixing the capacity of any garage to be constructed, it is advisable to determine the probable unsatisfied parking demand at the site. This information will make it possible to avoid over-development of new facilities and will assist in estimating parking revenue. The process used in the present study was to ascertain first the number of automobile trips which terminate on an average day at or near the garage site and then to deduct therefrom the number of these trips which can now be accommodated with parking space either on the streets or in existing parking garages or lots. The remainder represents the number of cars which would be parked in new facilities if they were available.

Area of Influence

Conforming with the results of numerous investigations throughout the country, it was assumed that a motorist will not pay a fee for parking at a location which is more than 1000 feet

from his destination. This made it possible to draw on a map the boundary of the area of influence of each of the four proposed garages, that is the area within which automobile trip terminations and available parking spaces should be ascertained. The areas were obviously of different sizes and shapes depending upon the position of the several sites in relation to the street pattern.

Origin - Destination Survey

Original data on ultimate destinations of parkers were obtained from the Bay Area Metropolitan Traffic Survey which was conducted by the State Division of Highways in 1947. For the purpose of this survey, the City was divided into numerous zones and all trips beginning or terminating in each zone were tabulated. Nine of these zones are found to coincide in part with the areas of influence established for the various proposed garage sites. It was found convenient to use reported origin of trips in each zone rather than destinations but this introduces no error since origins of trips on a given day must be approximately equal to destinations.

Reduction of Data

The survey data included all trips for an average 24 hour day into each zone from all areas within San Francisco as well as from areas outside of the City. A factor was applied to convert these figures from the 24-hour period to the 12-hour period between 7:00 A.M. and 7:00 P.M. Another factor was applied to eliminate those trips in which the driver of the vehicle did not

park but simply stopped to allow a passenger to get in or out of his car. A factor was also applied to pro-rate the zone trips to that portion of the zone which fell within the area of influence of each garage. These three factors were then combined into a single factor for each zone. Multiplying the original totals of the zones by the corresponding combined factors and adding the products gave the Total Demand at each garage site.

It is recognized that some of the motorists making the trips included in the Total Demand would not utilize garage space involving payment of a fee but it is believed that these trips would be offset by additional new trips which would be generated only because of a new and convenient garage.

Existing Parking Capacity At Curbs

Curbs within the area of influence of each garage were surveyed and existing parking stalls were classified as to type of restriction into one of the following categories: Metered one hour; metered 40 minutes; unmetered but parking permitted; no parking authorized but some parking tolerated. To the number of stalls in each category a turnover factor was applied to give the total number of vehicles parked during the 12-hour period. These factors were developed by sampling existing conditions in the vicinity of the proposed sites and comparing the turnover figures with those developed in previous reports.

Existing Off Street Parking Facilities

Reviews of two previous reports and new surveys of present use of all off-street parking facilities within each area of influence were made. While the data developed from these three surveys

did not agree exactly, it was possible to determine with sufficient accuracy the present capacity and the 12-hour total load for those off-street facilities within each area. In one or two instances where certain garages were located on the fringe of an area only a portion of the total load was used.

Summary of Parking Demand

Having determined total demand and available capacity, the net unsatisfied demand is readily determined by subtraction as mentioned previously. A summary of the calculation for each garage site is included in Appendix A. The following table shows the significant results:

TABLE II

PARKING DEMAND SUMMARY

Number of Cars Parked in 12 hours

ITEM	PROPOSED SITES			
	SITE 1	SITE 2	SITE 3	SITE 4
Total Demand	7,370	8,465	8,800	10,220
Existing Capacity				
Curb	4,243	4,818	5,119	5,401
Off-Street	2,066	2,161	2,398	2,534
Total	6,309	6,979	7,517	7,935
Unsatisfied Demand	1,061	1,486	1,283	2,285

It will be noted that Total Demand increases as the several sites are considered in order progressing from west to east, i.e. in numerical sequence. Somewhat surprisingly, however,

the Unsatisfied Demand for Site No. 2 is greater than that for No. 3. This is due to the sharp increase in the metered capacity for No. 3 which satisfies more of the demand.

From the Unsatisfied Demand figures, the required garage capacity can be determined if the rate of turnover is known, i.e. the average number of cars parked per stall per day. Studies of turnover in garages similarly situated in the City indicate that 1.5 is a conservative figure to use for estimating. On this basis, the number of stalls required to completely satisfy the demand at each of the proposed sites would be about as follows:

Site No. 1	710 stalls
Site No. 2	990 stalls
Site No. 3	860 stalls
Site No. 4	1520 stalls

Future Trend

The demand for parking space in the downtown area is certain to increase in the forseeable future but the rate of increase is difficult to predict. Factors tending to create additional demand are (1) continuing growth of population particularly in suburban areas; (2) increasing automobile registrations; (3) increasing use of private cars; (4) construction of freeways and street improvements; (5) probable further restrictions on curb parking; (6) loss of existing parking lots taken over from time to time for new building construction; and (7) anticipated erection of new office buildings in the vicinity.

These factors may be offset in part by greater use of mass transportation induced by improved facilities and the development of outlying shopping centers with free and convenient parking space.

Studies of overall traffic and transportation plans for the City completed in 1948, taking into account all of the above factors, indicated that an increase of at least 25% in automobile use and parking demand by 1970 should be contemplated in the planning of garage facilities. For the purpose of estimating garage income a rate of increase of demand equivalent to 1% a year would be conservative.

GARAGE DESIGN REQUIREMENTS

Garages over 2 stories in height must be of Class 1 construction under the San Francisco building code. Since garage heights are limited by operating requirements, reinforced concrete will normally be more economical than structural steel frame construction, although the latter offers less obstruction of floor space by structural columns. Architectural treatment must be approved by the Art Commission. Enclosing walls may be omitted on sides of a garage facing a street 50 feet or more in width. This device reduces structural costs and avoids the use of ventilating equipment. For appearance it is recommended that lattice or grill-work be placed in exterior wall openings facing main streets.

Parking floors should normally have a 22-foot aisle with stalls on both sides. Stalls should be deep enough to accommodate cars 18 feet long. The width may be 7-1/2 feet if attendant parking is contemplated but should be 8 feet if customers are to park their own cars. The combination of an aisle with two rows of stalls gives a normal unit floor width of 58 feet. With attendant parking, it is permissible to allow double parking, end to end, in portions of the floor area.

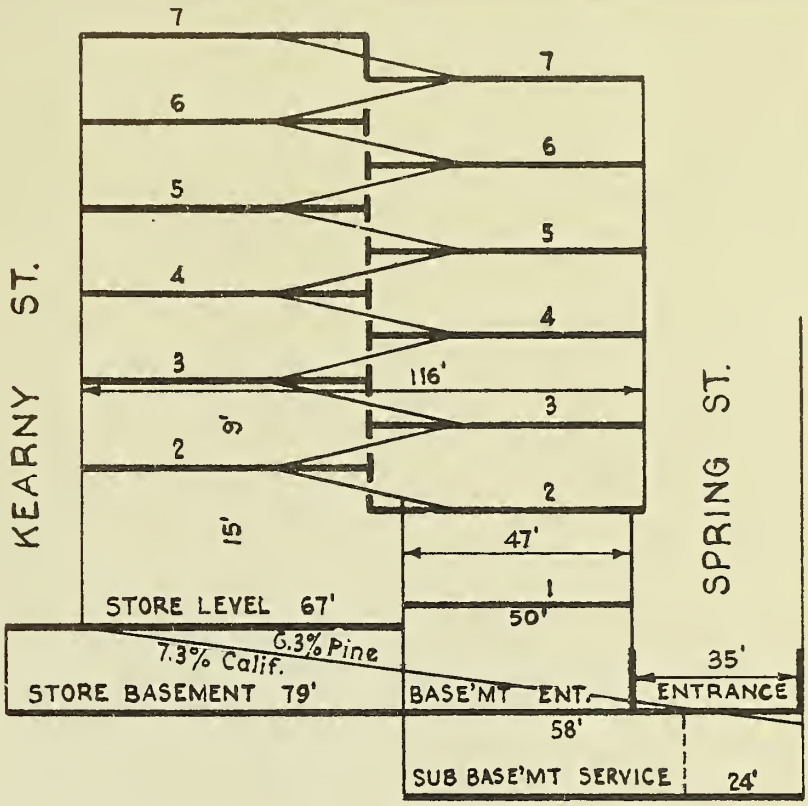
The receiving floor should provide several entrance lanes and have reservoir capacity properly coordinated with the rate at which cars can be removed and parked during peak intake periods. Ramps or elevators must be designed to permit rapid delivery of cars to customers during peak outflow periods. Since garages in the area under study will be used to a large extent by all day parkers, the discharge facilities should be capable of delivering 50% of total capacity in the one-half hour period from 5:00 to 5:30 P.M.

Mechanical parking equipment is not recommended at this time. A number of schemes are offered for sale including Park-O-Mat, Bowser System, Cannell System and others. None are in operation in this country. A garage now under construction in Des Moines, Iowa, will employ the Bowser System and this project should be watched with interest. Future garage undertakings on high-priced land in San Francisco where 7 to 15 stories may be needed for capacity may possibly prove to be feasible only through the use of some type of mechanical parking equipment.

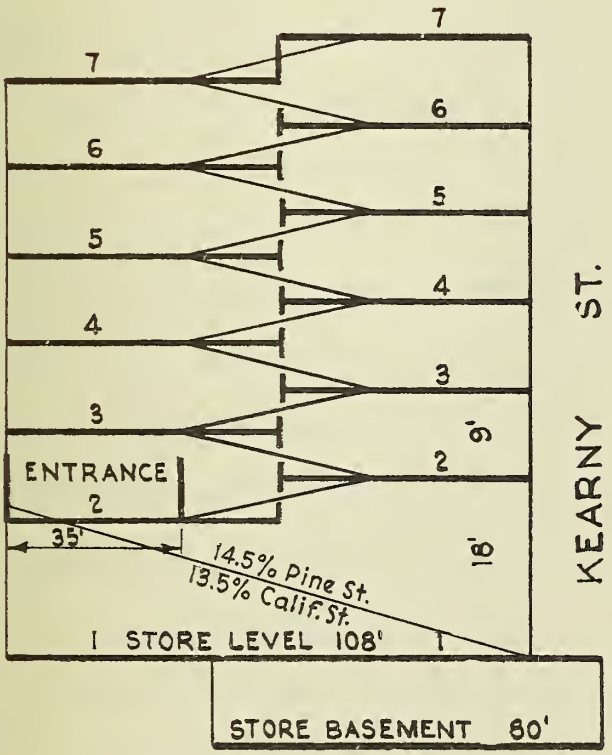
Facilities for servicing cars should be provided on the floor level first reached from the street. Such services tend to attract parking patronage and the income therefron is probably essential to assure the financial soundness of a garage venture.

Proposed Sites 2, 3 and 4 have street frontages which should be rented so far as possible for commercial or light industrial purposes. The rental of this space will add to the project income and such use of the space will tend to increase patronage of the garage. It is recommended that the street floor of all frontages be rented over and above needs for entrances, exits and servicng facilities.

The major layout problem in design of a garage is the scheme for circulation, that is the movement of cars in and out and particularly between floors. Many different plans have been used in existing garages, some having been designed to fit special site conditions. Elevators have generally been discarded in favor of ramps to give more speed and avoid delays due to mechanical trouble. A frequently used design often called the "staggered floor system" divides the building into two parts with offset floors so that each ramp rises only a half story. This is the scheme used in the Union Square Garage. The sites considered in this report offer no particular limitation on the circulation plan to be employed and no recommendation is made as to the type which should be adopted. Typical cross-sections of typical staggered floor plans for Sites 2 and 3 are shown on Plate II, which was drawn primarily to indicate the relation of the ground floor stores to the various parking floors.



TYPICAL SECTION — SITE 3



TYPICAL SECTION — SITE 2

POSSIBLE FLOOR ARRANGEMENTS
GARAGE SITES 2 & 3
IN VICINITY OF
ST. MARY'S SQUARE
SAN FRANCISCO
DEPT. OF PUBLIC WORKS
BUREAU OF ENGINEERING
SEPT. 1950 PLATE II

SCALE: HOR. 1"=40' VERT. 1"=20'

ENTRANCE AND EXIT FACILITIES

All four garage sites have frontage on both California and Pine Sts. In addition Sites 2 and 3 have frontage on Kearny St., which would seem to give them considerable advantage. It is recommended, however, that no access to adjoining garages be permitted on this frontage, except possibly for customers entering or leaving on foot. Kearny Street carries a heavy volume of mixed traffic (busses, trucks and passenger cars) in both directions. Cars emerging from a garage in the short block between Pine and California Sts. would have great difficulty in merging with or crossing the through traffic and would cause serious interference with the movement of vehicles on this important cross-town artery.

California and Pine Sts. are quite unlike Kearny St. California St. is used largely by people going to and from work, the heavy flow being eastbound in the morning andwestbound in the evening. Four lanes are available for traffic, although the two center lanes are not fully effective for vehicular movement because of the slow-moving cable cars and the rough pavement in the track area. The street level rises going from east to west, the rate of grade being 7% along sites 3 and 4, 13% along sites 1 and 2, and 18% in the next block to the west, namely from Grant Ave. to Stockton St. The somewhat flatter grades along the frontage of sites 3 and 4 give them some advantage over sites 1 and 2 from the standpoint of convenient and safe ingress and egress.

Pine St. is one-way west bound. During the evening rush hour three lanes are available for homeward bound vehicles. Street grades are much like those on California St., being 6%

along Sites 3 and 4, 14% along Sites 1 and 2, and 16% in the block from Grant Ave. to Stockton St. The rather heavy grades on both streets tend to discourage heavy trucking and consequently light vehicles move with little interference. The recently completed 3-light signal system on Pine St. has made this artery very popular with motorists.

Traffic conditions will permit both entrances and exits to the proposed garages on both California and Pine Sts. At Site No. 1, some advantage can be secured through the use of Quincy and St. Anne's Sts. Similarly Site 3 can make some use of Spring St. if desirable. On the Pine St. frontage, all entering cars will be coming from the east and departing cars will be able to proceed only to the west. This offers no handicap with reference to the evening outflow but tends to restrict the morning use of the Pine St. entrance, since vehicles approaching the business district from the west will find the California St. entrance more convenient. Lefthand turns on California St. are not desirable but can be tolerated in view of existing and probable future traffic conditions on this street. Garage operation should be arranged so as to encourage east-bound arrivals in the morning to use California St. and west-bound departures in the evening to use Pine St.

Sites 1 and 4 have an advantage over Sites 2 and 3 in that their entrances will be farther away from street intersections. Vehicles leaving the garage will have more distance in which to merge with street traffic before being blocked by cross traffic and will have less tendency to congest the garage exit. At the

same time, entering vehicles will be less likely to cause interference with cross traffic at the Kearny St. intersections.

Site 1 is at a disadvantage because customers calling for their cars will have a rather stiff climb to reach the garage entrances. This might be offset by providing an approach from the middle of the block on Kearny St. equipped with escalators or possibly with a tunnel extending to one of the lower levels of the garage. This alternative would be rather expensive both for land and construction.

RECOMMENDED GARAGE CAPACITIES

Determination of the proper capacity for any of the proposed garages should be based on consideration of three factors: (1) unsatisfied demand for parking in the vicinity; (2) capacity of adjoining streets to absorb peak hour outflow from the garage; and (3) physical limitations of the site area and practical story heights. As previously shown, the numbers of stalls required to meet the full unsatisfied demand at Sites 1, 2, 3, and 4, here under study, are 710, 990, 860 and 1520 respectively.

The capacity of adjoining streets to absorb traffic can be considered to be the same for all four sites, if access from Kearny St. is to be prohibited as previously recommended. California and Pine Sts. pass all four sites under practically similar conditions. During the evening peak hour, when the predominant vehicular movement is west-bound, two traffic lanes in that direction are in use on California St. and three on Pine St.

It is safe to assume that the equivalent of two of these five lanes could be utilized by vehicles leaving the garage. Since the maximum capacity of a single lane on a city street is about 500 cars per hour, the maximum discharge from the garage in the half-hour evening peak period into two street lanes would be 500 cars. On the basis previously stated that the half-hour peak discharge should be 50% of total capacity it is apparent that 1000 stalls should be taken as the maximum permissible capacity of any of the proposed garages.

The physical limitations on capacity of a garage on any particular site are derived from construction or operating considerations. For an underground garage, such as site No. 1, the cost of construction increases rapidly with increasing depth, principally due to the expense of shoring the deep excavation and building heavy retaining walls. Three floors underground are usually considered the limit from the standpoint of economics. The St. Mary's Square site being rather limited in area, it has been assumed that four floors below ground would be justified by the need for a reasonably ample number of parking stalls.

At the other three sites, the above-ground garages are not limited in height by any foundation or structural conditions. The limiting condition here is operational. The greater the number of stories, the more time or expense will be involved in the process of parking or removing the cars assigned to stalls on the upper floors. A point is reached where the cost of operating an added floor exceeds the net income that can be derived from it. From

the fact that few commercial garages have exceeded five or six stories, it may be assumed that the economic limit is about six stories with the roof making a possible seventh.

With the above limits on number of stories and knowing the ground area of each site, it is a simple matter to compute the gross floor area for each garage. In the case of St. Mary's Square, it has been assumed that the garage could utilize half of the subsurface areas under Quincy St. and St. Anne's St. and that sub-sidewalk areas could be utilized on California and Pine Sts. In all cases, certain areas have been assigned to servicing facilities and at Sites 2, 3 and 4 substantial ground floor areas have been set aside for stores and businesses on a rental basis. Plate III shows typical floor plans for Sites 2 and 4. The resulting areas and the net number of parking stalls for each site are shown below.

TABLE III

ESTIMATED AREAS AND CAPACITIES

ITEM	SITE 1	SITE 2	SITE 3	SITE 4
Area 1st Floor Sq.Ft.	(32,400 (40,200	29,000	30,600	34,600
No. of Floors	4	7	7 Main & 2 Bmts.	7 & Bmt.
Area All Floors Sq.Ft.	153,000	203,000	248,800	280,800
Servicing Area " " (Incl.Reservoir)	23,000	25,000	25,000	32,500
Store Area " "	None	29,000	18,500	12,100
Store Basement	--	22,000	22,000	--
Net Garage Space " "	130,000	149,000	205,300	236,200
No.of Parking Stalls	520	600	820	950

NOTES: Garage floor areas exclude 1 ft. for outside walls only.

Store Areas gross. Stalls 250 sq. ft. each (25% double-parked).

Site 1. One floor at 108 x 300 + fl. at 134 x 300 = 153,000 sq.ft.

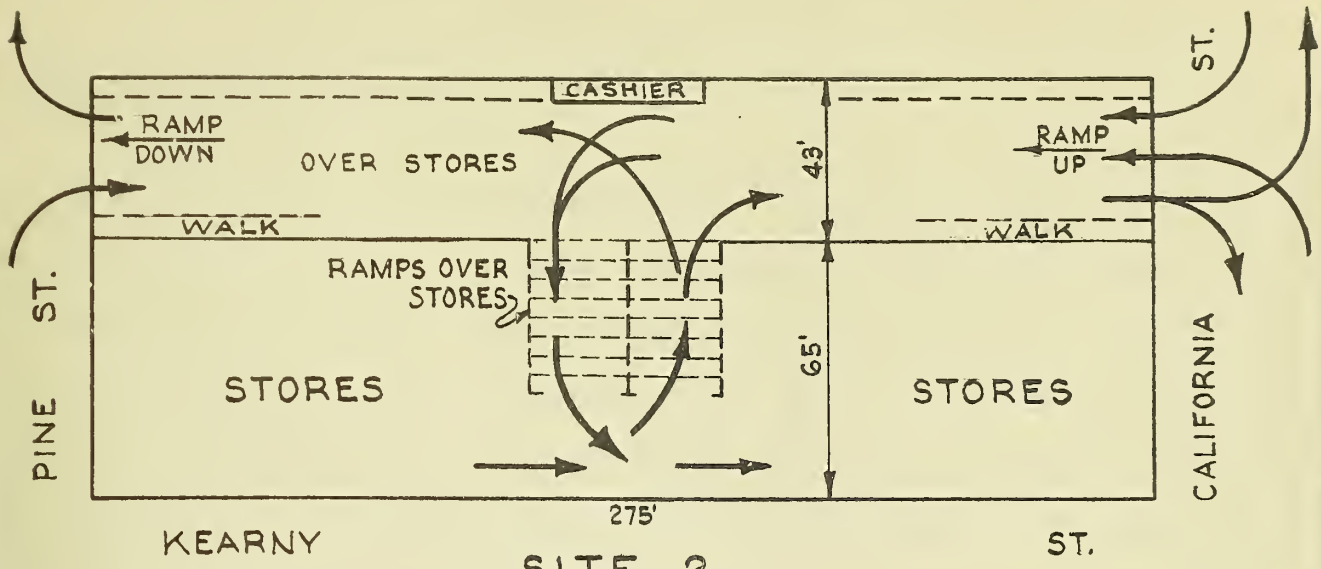
Site 2. Store Area. 108 x 275 -- Ent. Floor 45 x 275.
-- 1st fl. 106 x 273. 7 fl. (incl. Roof) at 29,000
= 203,000 less (25,000+ 29,000) = 149,000 sq.ft.

Site 3. Store 67 x 275. Store Basement 80 x 275. Garage Bmt. Ent. 50 x 275 = 13,800 sq.ft. -- Gar. Sub.Bmt. Service 58 x 297 + 24 x 148 = 20,800 sq.ft.
1st fl. 112 x 273. 7 fl. at 30,600 = 214,200 + Basement fls. (13,800 + 20,800) = 248,800 less 43,500 = 205,300 sq.ft.

Site 4. Store 160 x 70 + 15 x 60 = 12,100 sq.ft. -- Main Floor 123 x 273 + 17 x 63 7 at 34,600 + Basement 305 x 123 + 65 x 17 = 38,600. Total 280,800 sq. ft.

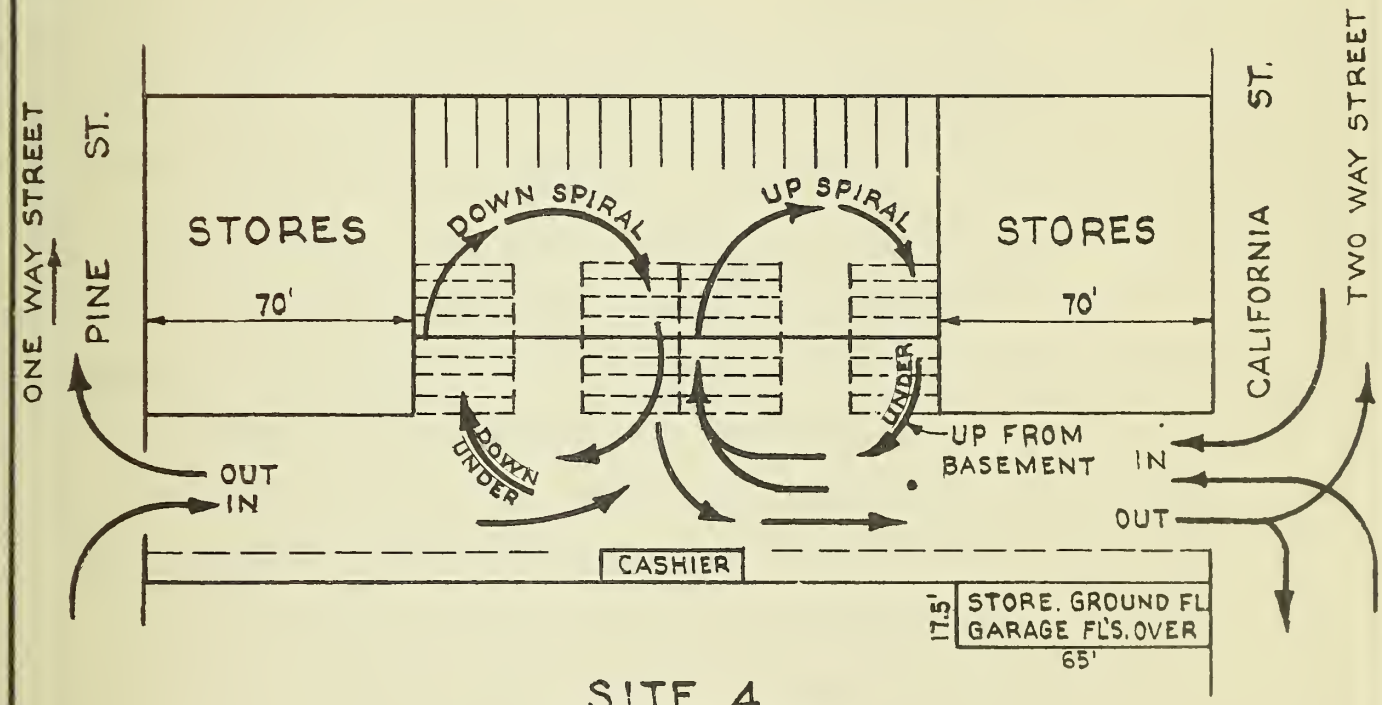
All of the capacities shown on the bottom line of Table III are less than the other limitations on capacity previously discussed and may therefore be accepted for use in studies of cost and income. They probably represent about the maximum economic development of these sites.

It should be kept in mind that Site 4 is now occupied by a 300-stall garage and that the proposed 950-stall capacity results in an immediate net increase of only 650 stalls. This, however, is only a passing condition. The site is certain to be devoted to more profitable use in the near future. As soon as a building is started on the site, the garage space is lost and as soon as the building is completed, the parking demand is still further intensified. In comparing the merits of the four sites, it is therefore reasonable under the above circumstances to consider Site 4 at its full proposed capacity.



SITE 2

STORE AND ENTRANCE LEVELS



SITE 4

GROUND LEVEL FLOOR

TYPICAL FLOOR PLANS
GARAGE SITES 2 & 4
IN VICINITY OF
ST. MARY'S SQUARE
SAN FRANCISCO
DEPT. OF PUBLIC WORKS
BUREAU OF ENGINEERING
SEPT. 1950 PLATE III

REQUIRED CAPITAL INVESTMENT.

The initial cost of a garage project will consist of land acquisition, site clearing, construction, equipment, interest during construction, engineering, and administrative legal and incidental expense. A garage at St. Mary's Square will require no expenditure for land but there will be an added expense for restoring the park after the subsurface work has been completed.

Aside from the cost of land, which has previously been discussed, the cost of construction is the most important item and the one most difficult to estimate. An accurate estimate could be made only by preparing complete preliminary designs and then determining the quantities of the various types of work. In the present study, a separate design would be necessary for each of the sites under consideration and each one might require several trial layouts before the most economical could be chosen. In the absence of such preliminary designs, costs must be estimated on the basis of unit costs for similar structures already built or planned, such as cost per sq. ft. of floor, cost per cu. ft. of enclosed volume or cost per parking stall. In the present case, estimates are based on costs per square foot. The resulting overall costs will be sufficiently accurate for use in comparing the relative merits of the various sites.

The following unit prices, which were used in the cost estimates below, are based on current prices for similar work and

are intended to cover construction , equipment and all incidental costs, except land and wrecking existing buildings:

Above ground structures	
Garage areas (roof excluded)	$8.00 per sq. ft.
Store areas	$15.00 " " "
Basements already excavated	6.00 " " "
Underground garage	12.00 " " "

TABLE IV.
CAPITAL INVESTMENT

ITEM	SITE 1	SITE 2	SITE 3	SITE 4
Area (Sq. Ft.)				
Garage floors	153,000	145,000	199,700	234,100
Store floors		29,000	18,500	12,100
Basements		22,000	22,000	38,600
Construction Cost				
Garage floors	$1,836,000	$1,160,000	$1,597,600	$1,872,800
Store floors		435,000	277,500	181,500
Basements		132,000	132,000	231,000
Total	$1,836,000	1,727,000	2,007,100	2,285,900
Wrecking Bldgs.		20,000	15,000	50,000
Total except Land	$1,836,000	1,747,000	2,022,100	2,335,900
Adjusted total	$1,800,000	1,750,000	2,000,000	2,350,000
Land Acquisition		900,000	1,250,000	1,000,000
Total Investment	$1,800,000	$2,650,000	$3,250,000	$3,350,000

From the above tabulation, the following unit costs per stall can be derived:

	SITE 1	SITE 2	SITE 3	SITE 4
No. of stalls	520	600	820	950
Gross cost per stall	$3,450	4,420	3,960	3,520
Cost excl of stores	3,450	3,470	3,625	3,340
Cost excl. of stores and land	3,450	1,970	1,970	2,270

ANNUAL INCOME.

Garages at all of the proposed sites will derive income from parking fees, sale of gas and other products, and services rendered such as washing, polishing and minor repairs. In addition Sites 2, 3 and 4 will produce substantial income from rentals of street frontages for stores and shops.

Parking Fees

Based on rates now being charged in garages similarly located, the following schedule of parking fees has been used for estimating income:

Period	Rate
2 hrs. or less	$ .35
2 to 4 hrs.	.50
4 to 6 hrs.	.75
over 6 hrs.	1.00
Month	$20.00

The average fee paid per car parked during the day, exclusive of monthly parkers, is determined by estimating the

percentage distribution between the above periods and multiplying by the corresponding rates as indicated below:

TABLE V.

AVERAGE FEE PAID BY DAY TIME PARKERS

RATE	SITE 1		SITE 2		SITE 3		SITE 4	
	%	Fee	%	Fee	%	Fee	%	Fee
.35	60	.21	50	.175	50	.175	40	.14
.50	30	.15	25	.125	25	.125	30	.15
.75	5	.04	15	.11	15	.11	20	15
1.00	5	.05	10	.10	10	.10	10	.10
Av. Fee		$.45		$.51		$.51		$.54

Total parking revenues will include fees collected monthly, day-time, evenings, nights and on Sundays and holidays. There is a heavy demand in the vicinity for regular monthly parking and it has been assumed that half the stalls in each garage would be devoted to that use. This type of parking produces greater income than transient day parking and tends to reduce operating costs.

Estimates of annual fees derived from parking are shown in the following table.

TABLE VI.

TOTAL ANNUAL PARKING REVENUE

	SITE 1	SITE 2	SITE 3	SITE 4
Total No. of Stalls	520	600	820	950
Day Time Parking				
No. of Stalls Used	260	300	410	475
Turnover	1.4	1.5	1.5	1.5
No. of Cars Parked	364	450	615	710
Average fee	$ .45	$.51	$.51	$.54
Daily revenue	$164	$230	$314	$383
Annual-306da.	$50,184	$70,380	$96,084	$117,198
Evening Parking				
No. of cars	(50)	(100)	(100)	(100)
365 da.at$.50	$9,125	$18,250	$18,250	$18,250
All night Parking				
No. of cars	(50)	(100)	(100)	(100)
365da.at$1.00	$18,250	$36,500	$36,500	$36,500
Sundays & Holidays				
No. of cars	(50)	(100)	(100)	(100)
59da.at$1.00	$2,950	$5,900	$5,900	$5,900
Monthly Parking				
No. of Stalls	(260)	(300)	(410)	(475)
12mo.at$20	$62,400	$72,000	$93,400	$114,000
ANNUAL PARKING REVENUE	$142,909	$203,030	$255,134	$291,848

Sale of Products and Services

The income from sales of gasoline, grease, oil tires and other products and from miscellaneous services is likely to vary widely depending on convenience of service, type of customer and sales promotion. Experience in existing garages indicates a profit running between 10¢ and 15¢ per car parked. This is exclusive of labor which is included as an operating expense.

The estimates which follow are based largely on figures used in the service station and garage industry. It is assumed that gasoline sales will average 1 gallon per car parked per day. The average profit on gasoline is about 5.4¢ per gallon or per car parked. Lubricating oils are sold at the rate of about 20 gallons per 1,000 gallons of gasoline, the profit being 75¢ per gallon or 1.5¢ per car parked. Lubrication and grease sales should average $35.00 per 1,000 gallons of gasoline which, after deducting $5.00 for materials, gives a profit of 3¢ per car parked. Other sales and services are estimated to run from 3¢ to 3½¢ per car parked. An estimated breakdown of sales and service income is shown in the following table.

TABLE VII.

AVERAGE INCOME RATES FOR SALES AND SERVICES

EXCLUDING WASHING & DUSTING

ITEM	AV. INCOME PER CAR PARKED
Gasoline sales	5.4¢
Lubricating & greasing	3.0¢
Oil, drain and fill	1.5¢
Oil, make-up	0.3 to 0.4*
Tires, tubes & recaps.	0.7
Battery sales	0.3 to 0.4*
Accessory sales	1.2
Tire and battery repairs	0.3 to 0.4*
Miscellaneous service	0.3 to 0.4*
Total	13 0¢ to 13.4¢

* The smaller figures are used hereinafter for Sites 1 and 2 and the larger for Sites 3 and 4.

Car washing is a special type of service, the amount of which is quite variable. In the previous estimates of monthly parking fees, the washing anddusting service revenue was not included. Garages catering to monthly trade include two washings and a daily dusting at a somewhat higher monthly rate. In the larger garages a special selling program is aimed at this business. Estimates which follow for the smaller garages at Sites 1 and 2 show 50 to 65 washings daily, with charges partly including monthly customers' service. At the larger garages at Sites 3 and 4 the amount of this service has been increased to

from 30 to 100 cars. It is not feasible to undertake this service unless it is conducted on a large scale with special facilities.

Miscellaneous work such as dusting and cleaning has been included to meet the demand of monthly as well as incidental patrons at a rate of 25¢ for a limited number of cars.

The daily and annual income from all sales and services at the four garage sites are estimated as shown in Table VII.

TABLE VIII.

ANNUAL INCOME FROM SALES AND SERVICES

ITEM	SITE 1	SITE 2	SITE 3	SITE 4
No. of Cars Parked	620	750	1,020	1,180
Sales & Services				
Daily Inc. per car	13.0¢	13.0¢	13.4¢	13.4¢
Daily Amount	$81.00	$97.50	$136.00	$158.10
Car Washing				
No. of cars	(50)	(65)	(80)	(100)
Income at $2	$100.00	$130.00	$160.00	$200.00
Dusting				
No. of cars	(25)	(50)	(50)	(50)
Income at 25¢	$6.25	$12.50	$12.50	$12.50
Total Daily Income	$187.25	$240.00	$308.50	$370.60
Average daily per car	30.2¢	32.0¢	30.2¢	31.4¢
TOTAL ANNUAL (306 da.)	$57,300	$73,400	$94,400	$113,400

Store Rental

Store rentals have been estimated on the basis of $12.00 per front foot per month on Kearny St. for the 275 foot frontages in Sites 2 and 3. The aggregate frontages of Site 4 on California and Pine Sts. amounting to 175 feet have been estimated at $15 per front foot per month.

Summary of Income

Income from all sources is summarized below.

TABLE IX.

TOTAL ANNUAL INCOME

ITEM	SITE 1	SITE 2	SITE 3	SITE 4
Parking	$142,909	$203,030	$255,134	$291,848
Sales & Services	57,300	73,400	94,400	113,400
Store rentals	---	39,600	39,600	31,500
Total	$200,209	$316,030	$389,134	$436,748

ANNUAL OPERATING COST.

The payroll is the principal item of operating cost. Necessary employees include attendants, service men, janitors, cashiers and others. For attendant parking as contemplated herein, rather than customer parking, a large number of attendants must be on duty during rush hour periods. Some of them may be employed on a part time basis. Others can be assigned to repair and service facilities within the garage during off-peak hours.

In the following table, the number of employees shown represents the number of man-days per day needed to handle the parking of cars as well as all of the service functions previously described as contributing to income. The payroll costs are intended to cover social security taxes and compensation insurance. Other costs tabulated are based on reported experience in existing garages.

TABLE X.

ANNUAL OPERATING COST

ITEM	SITE 1	SITE 2	SITE 3	SITE 4
No. of Employees	40	50	65	70
Payroll	$144,000	$170,000	$215,000	$231,000
Heat, Water, Elec	3,000	4,000	4,000	5,000
Supplies & Phone	3,000	3,500	4,000	5,000
Uniforms & Upkp.	2,000	2,500	3,000	3,500
Mtc. & Repairs	3,000	4,000	5,000	5,500
Insur. & Claims	3,000	4,000	5,000	6,000
Adm. & Genl. Exp.	7,000	9,000	10,000	12,000
TOTALS	$165,000	$197,000	$246,000	$268,000

NET OPERATING INCOME.

The net operating income for each garage is readily determined by deducting operating cost from gross income. The remainder is the amount available to pay income taxes, payments due the city in lieu of taxes or as rental of property, interest on bonds or loans, amortization of any indebtedness, and profit to

private parties engaged in operating the garage, if any. Without knowing the amount of city participation in the project, the type of debt structure and the relationship which might be established between the city and private parties, it is impossible to allocate the net operating income to the various objects of expenditure mentioned.

Such allocation, however, need not be made prior to selection of the particular site to be developed. The relationship of income to investment will indicate the relative merits of the various sites from the standpoint of debt retirement. The following table shows the derivation of the net operating income, as well as total investment and rate of return for each of the proposed garages.

TABLE XI.

NET OPERATING INCOME AND RETURN

	SITE 1	SITE 2	SITE 3	SITE 4
Total Investment	$1,800,000	$2,650,000	$3,250,000	$3,350,000
Gross Income	200,209	316,030	389,134	436,748
Operating Cost	165,000	197,000	246,000	268,000
Net Operating Income	35,209	119,030	143,134	168,748
Return on Investment	1.96%	4.50%	4.40%	5.04%

SITE NO. 1

(ST. MARY'S SQUARE)

DEMAND

BAMTS Zone	Zone Origins	Combined Factor	Effective Origins
011	5913	.43	2550
12	2710	.07	200
23	2576	.15	380
24	1426	.18	260
713	8448	.14	1150
912	5011	.19	960
913	4876	.38	1870
		Total Demand	7370

EXISTING CAPACITY

Curb Parkers			
Metered --			
	1 hr.	263 x 9 = 2367	
	40 min.	101 x 11 = 1111	
Unmetered		59 x 3 = 177	
No Parking		196 x 3 = 588	
		Total Curb	4243
Off Street Parkers			2066
		Total Existing Capacity	6309
UNSATISFIED DEMAND			1061

SITE NO. 2

(WEST SIDE OF KEARNY)

DEMAND

BAMTS Zone	Zone Origins	Combined Factor	Effective Origins
011	5913	.55	3230
012	2710	.43	1170
023	2576	.06	160
024	1426	.29	420
126	3196	.07	210
713	8448	.08	675
912	5011	.15	750
913	4876	.38	1850
		Total Demand	8465

EXISTING CAPACITY

Curb Parkers			
Metered -- 1 hr.	241 x 9 =	2169	
40 min.	171 x 11 =	1881	
Unmetered	56 x 3 =	168	
No Parking	200 x 3 =	600	
	Total Curb		4818
Off Street Parkers			2161
	Total Existing Capacity		6979
UNSATISFIED DEMAND			1486

APPENDIX A-3
Parking Demand

SITE NO. 3

(EAST SIDE OF KEARNY)

DEMAND

BAMTS Zone	Zone Origins	Combined Factor	Effective Origins
011	5913	.58	3440
012	2710	.51	1380
023	2576	.06	160
024	1426	.29	420
126	3196	.07	210
713	8448	.08	640
912	5011	.14	700
913	4876	.38	1850
		Total Demand	8800

EXISTING CAPACITY

Curb Parkers		
Metered -- 1 hr.	234 x 9 = 2106	
40 min.	206 x 11 = 2266	
Unmetered	47 x 3 = 141	
No Parking	202 x 3 = 606	
Total Curb		5119
Off Street Parkers		2398
Total Existing Capacity		7517
UNSATISFIED DEMAND		1283

APPENDIX A-4
Parking Demand

SITE NO. 4

(MID-BLOCK BET. KEARNY & MONTGOMERY)

DEMAND

BAMTS Zone	Zone Origins	Combined Factor	Effective Origins
011	5913	.72	4300
12	2710	.65	1760
13	1098	.29	310
23	2576	.03	80
24	1426	.30	420
126	3196	.19	600
713	8448	.38	320
912	5011	.11	570
913	4876	.38	1860
		Total Demand	10,220

EXISTING CAPACITY

Curb Parkers

Metered -- 1 hr.	236 x 9 =	2124	
40 min.	233 x 11 =	2563	
Unmetered	19 x 3 =	57	
No Parking	219 x 3 =	657	
	Total Curb		5401
Off Street Parkers			2534
	Total Existing Capacity		7,935
UNSATISFIED DEMAND			2,285